

A CMOS Voltage-Controlled Oscillator (VCO) with a Current-Adaptive Resistor for Improved Linearity

Abstract

A voltage-controlled oscillator (VCO) from a phase-locked loop (PLL) has improved bandwidth and performance at lower frequency. A variable current source supplies a current to an internal oscillator-power node. The current varies with the VCO input voltage. The internal oscillator-power node drives the sources of p-channel transistors in inverter stages in the ring oscillator. The variable current causes the internal oscillator-power node's voltage to vary, which varies the output frequency. An active resistor is in parallel with the ring oscillator. The active resistor has a resistor and an n-channel transistor in series between the oscillator-power node and ground. The n-channel transistor has a fixed bias voltage on its gate and is non-linear. The non-linear effective resistance of the n-channel transistor improves overall linearity of the ring oscillator. The parallel effective resistance of the active resistor lowers overall effective resistance of the ring oscillator. Oscillator bandwidth at lower frequencies improves